VEGETATION

Introduction

This and the following three sections describe the existing situation of the area and the components of the vegetation resource affected by the proposed action and its alternatives. The alternatives would affect these vegetation-related components:

- Vegetative structure, composition, and timber resource
- Spruce and Douglas-fir bark beetle populations and potential spread
- Sensitive plants
- Noxious weeds

Analysis area boundaries differ depending on the affected component, and are defined for each component.

Analysis Area

The analysis area used for the vegetation resource is displayed on Figures 3-1 through 3-4, and incorporates the boundaries of the four fires, a total of approximately 31,545 acres. This area includes all the proposed activities that have any measurable effects to vegetation structure, composition or pattern. Information will most often be presented for each of the four fire areas and then totaled for entire West Side Reservoir project area.

Information Sources

Existing vegetation data based on past stand examinations, satellite imagery, geographic information systems, modeling, and recent past experience with large fires on the forest which provided information used to characterize the affected environment for vegetation within the West Side Reservoir Post-fire project area. On-the-ground field visits are being conducted this season to gather data specific to resource issues, such as post-fire insect potential and activity, riparian boundaries, and vegetation conditions (Exhibit P-1).

Affected Environment

Fire severities and interpretation related to vegetation

The fires burned with varying intensity (BTUs) across the landscape. Intensity corresponded to fire behavior which ranged from creeping and smoldering to fast moving crown fires. Temperature, humidity, wind, topography, and fuel moistures can all influence how intensely a fire burns (DeBano *et al*. 1998). Aerial photography taken of the area after the fires occurred were analyzed to determine the effect of the fire on vegetation. See Exhibit P-1. Three broad categories were used to classify the effects of fire on the vegetation component of the landscape.

Low fire severity results in only low to moderate duff reduction and patches of unburned or lightly burned understory vegetation and trees. Immediate mortality of the overstory tree canopy is less than 40 percent. Many of the fire-killed trees still retain their small branches, twigs, and needles. Damage at the root collar is expected to result in eventual mortality of additional fire affected, thin-barked species such as spruce, lodgepole pine, and subalpine fir.

Moderate fire severity results in substantial duff reduction. The majority of the understory vegetation is burned but not completely consumed. There is a 40 to 80 percent immediate mortality in the overstory trees. Many of these trees still retain their small branches.

High fire severity results in complete consumption of the duff and understory vegetation. There is 80 to 100 percent mortality in the overstory canopy, often with total consumption of the tree crowns (needles, twigs, and small branches).

Table 3-1 below displays the fire severities within each of the fires analyzed (Exhibit P-2).

Satellite imagery from September 2003 indicates that about 1,200 acres remain unburned within the perimeters of the fires. However, some acres of underburning went undetected due to the remaining green canopy in the overstory. Field surveys were used to update the geographic information systems layer with data verified by ground-truthing. Additional mortality to trees, especially thin-barked species such as spruce, subalpine fir, and lodgepole pine, can be expected along the margins of areas characterized as *unburned* or of *low fire severity*; see Figures 3-1 through 3-4.

Table 3-1: Fire severities within the West Side Fires

WEST SIDE FIRE SEVERITY		
Severity	***Acres affected in Beta-Doris Fire**	**% of Fire Area**
High	1366	25.6%
Moderate	2383	44.7%
Low	1020	19.1%
Unburned	552	10.3%
Total	**5321**	**100%**
	***Acres affected in Doe Fire**	
High	861	27.9%
Moderate	1193	38.7%
Low	913	29.6%
Unburned	110	3.5%
Total	**3077**	**100%**
	***Acres affected in Blackfoot Fire**	
High	7005	46.9%
Moderate	4084	27.3%
Low	3324	22.2%
Unburned	521	3.4%
Total	**14,934**	**100**
	***Acres affected in Ball Fire**	
High	3809	46.9%
Moderate	1684	20.7%
Low	2611	32.1%
Unburned	12	0.1%
Total	**8116**	**100**

*Numbers are approximate due to GIS/satellite data processing and interpretation, rounding, water and rock.

Species Composition

Tree species found on the west side of the south fork drainage include subalpine fir, Douglas-fir, lodgepole pine, western larch, Engelmann spruce, whitebark pine, and western white pine. Whitebark pine was historically a major species in most stands at the upper elevations of the Swan Range, often mixed with substantial amounts of spruce and subalpine fir. Widespread blister rust infection, in addition to the mountain pine beetle outbreaks and effective fire suppression during the last few decades has resulted in increased mortality and decreased recruitment of whitebark pine. Ponderosa pine and western white pine were found in small, scattered amounts within the drainage, probably because they are near the edge of their ecological range. Western white pine is also susceptible to blister-rust, but some resistance is evident. This watershed contains a minor amount of habitat suitable for the development of ponderosa pine and western white pine cover types. Birch, cottonwood, and aspen are found at some lower elevations, often in areas that had been harvested a few decades ago. Common shrubs include Sitka alder, red osier dogwood and some devil's club. The valley floor of the South Fork of the Flathead contained a substantial amount of ponderosa pine before it was inundated with water.

The proportion of most forest cover types within the watershed is generally within the range of historical conditions. An exception was the amount of subalpine fir/spruce cover types in the areas, which at about 67 percent of the land area is well above expected historical conditions. Correlated with this high proportion of climax species cover type is a low proportion of the seral species such as white pine, ponderosa pine, larch and lodgepole pine cover types and, to a lesser degree, Douglas-fir cover types. Factors contributing to this high amount of spruce/subalpine fir include the long period (at least 250 years) since the last large wildfire over much of the area within the South Fork drainage, local climatic conditions which trend towards particularly high snowfall and associated shorter growing seasons, and the loss of most of the whitebark pine trees in the recent past to blister rust and mountain pine beetle. Cover groups affected by the four fires are displayed in Table 3-2 (Exhibit P-4).

Table 3-2: Acres affected by Fire Severity

Cover group	High	Moderate	Low	Unburned
Subalpine fir/Engelmann spruce/lodgepole pine	8999	6723	4526	917
Larch/Douglas-fir	2978	1718	2336	194
Non-forest (grass, shrub, rock)	1065	901	1005	84

*Numbers are approximate due to GIS/satellite data processing and interpretation, rounding, water and rock (non-forest).

Potential vegetation types (PVT) were mapped for the West Side Fires. PVTs are areas of similar growth conditions described by moisture, temperature, and soils, which lead to similar "climax" forest conditions in the absence of disturbance (Christensen 1989). PVTs also help define the fire regime for areas of a forest. Based on vegetation and cover types, a majority of the area is in a lethal fire regime with an 80-240 year fire return interval. Cool, moist vegetation types support very high levels of biomass, forming a continuous fuel load (Fischer & Bradley 1987). Long intervals between fires allow large amounts of fuel to accumulate. Under a lethal fire regime, fires burn into tree canopies and can kill most of the overstory trees. Mortality can vary depending on time of day when the fire burned through an area, fuel conditions, fire intensities (how hot the fire is burning), terrain, and weather. This lethal fire regime is found throughout the South Fork drainage in the cool, moist habitat types. A smaller portion of the fire area is classified in a mixed-severity fire regime with an infrequent fire return interval. This regime is confined to the drier south and west aspects in the Douglas-fir cover types. There is no indication the West Side Fires were outside of this expected and historical range of fire severity, though the area was approaching the upper limit in spruce-fir habitat types.

The dry PVTs comprise about 4143 acres within the fires (Exhibit P-12). This type would normally have low intensity fires with a frequency of 5 to 25 years rather than stand replacement fires. Fire exclusion has moved these communities toward a long-interval stand-replacement fire regime (Arno 2000). However, these patches of dry PVT are often surrounded by moist PVTs. A lethal fire occurring in the larger landscape would easily consume these dry PVT patches as well. In low elevation, mixed-severity classes the dry PVTs are often surrounded by Douglas-fir habitat types. This results in is a high probability that ponderosa pine and western white pine would be lost as a component on these habitat types in the high and moderate burn areas due to a lack of natural seed sources.

Forest Structure within the West Side Fires

Disturbance processes alter the successional pathways of forest vegetation. A severe fire, with total consumption of all live vegetation, will set a forest habitat back to the grass/forb/seedling or stand initiation stage, while the vertical structure provided by snags would persist. In the burned area, grasses and sedges were already resprouting in the autumn of 2003. Revegetation of shrubs can be expected in about six years (Stickney 1990).

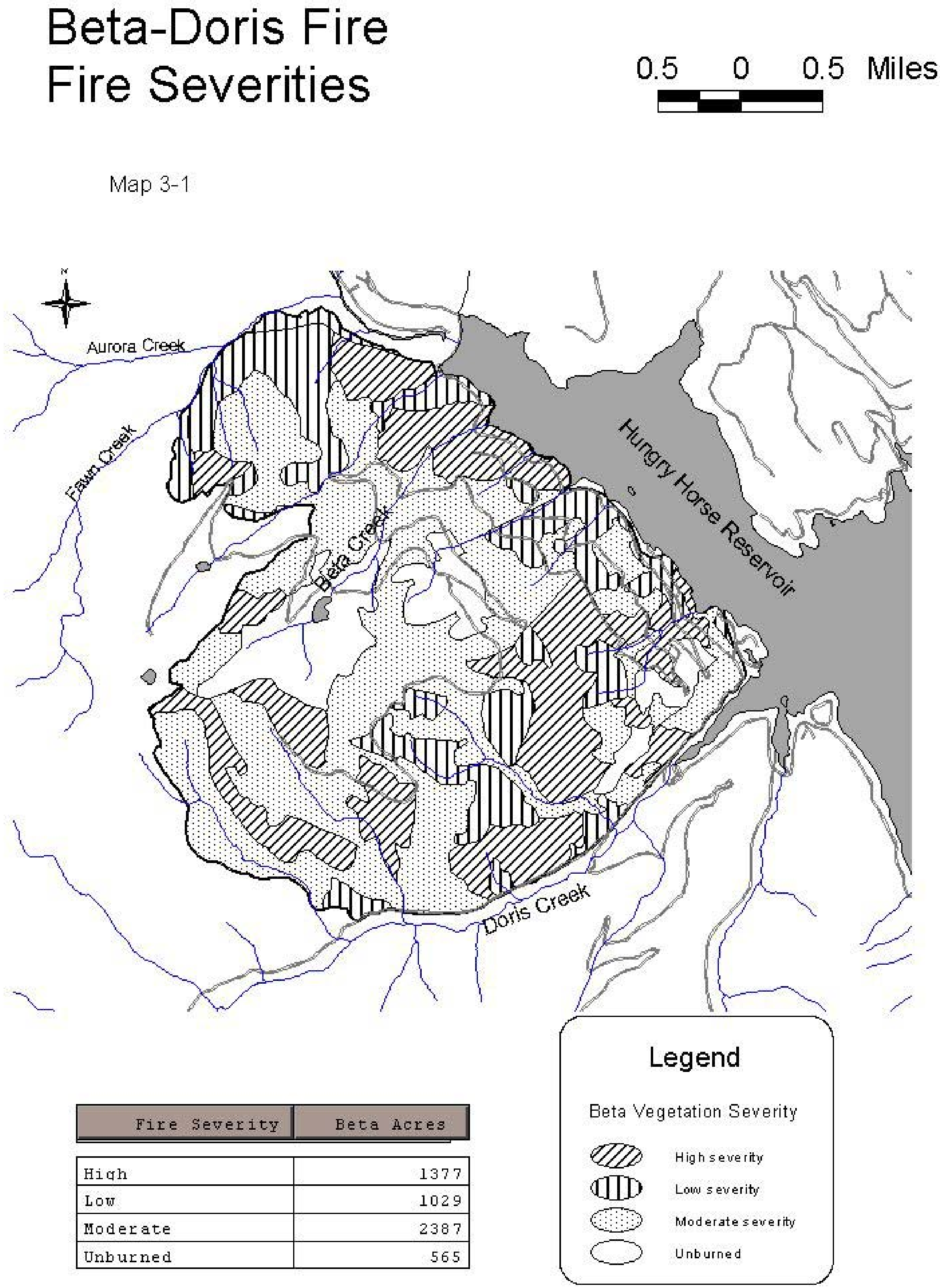
Figures 3-5 and 3-6 display the forest structural stages within the drainage and the burned portion of the drainage, before and after the fire. Some of the acreage within the West Side Reservoir fires had burned during previous wildfires, mainly the 1919 Fire. Other recorded fires within the watershed occurred in 1885, 1910, and 1926 (see Figure 3-13, Fire History and Exhibit P-3).

Fire is a disturbance process that affects forest structure. The range of severities experienced in the West Side Reservoir fires set back the successional and structural stages in many stands. The change in structure classification was a function of the fire severity and the cover type. Before the fire, 20,320 acres, or nearly 65 percent, of the area within the fire boundaries was in a late seral stage. It now comprises about six percent of the area within the fire boundaries. Five percent of the area was in a mid-seral or stem exclusion stage, mostly as a result of the 1919 and/or 1929 fires (See Figure 3-5 and map in Exhibit P-3). Most of the area that burned from 1919 to1929 regenerated to highly dense stands of lodgepole pine with stagnant growth. This is mainly limited to the south side of the Ball Fire. High mortality from the 2003 fires returned these stands primarily to stand initiation (refer to Figure 3-6). Spruce/subalpine fir stands will experience nearly complete mortality from a low to moderate intensity fire, and return to stand initiation, whereas older western larch and Douglas-fir stands experiencing the same fire intensity may lose the understory but few or no overstory trees. These Douglas-fir and larch stands are now classed as understory reinitiation due to the new available growing space; see Figure 3-6 and Exhibit P-5.

About 2654 acres had burned during the last 100 years. Many of those acres regenerated to thick stands of lodgepole pine. Due to competition these burned areas were populated by 80 to 90 year-old, 5 to 8 inch diameter trees. Structurally the stand was in the mid-seral, “stem exclusion” stage. This stage is characterized by similar sized trees occupying all of the growing space which allows little or no light to reach the forest floor creating a difficult environment seedling establishment (Oliver & Larson 1996). Most of these pole-sized stands were unmanaged at the time of the West Side Reservoir fires, and provided a continuous fuel matrix.

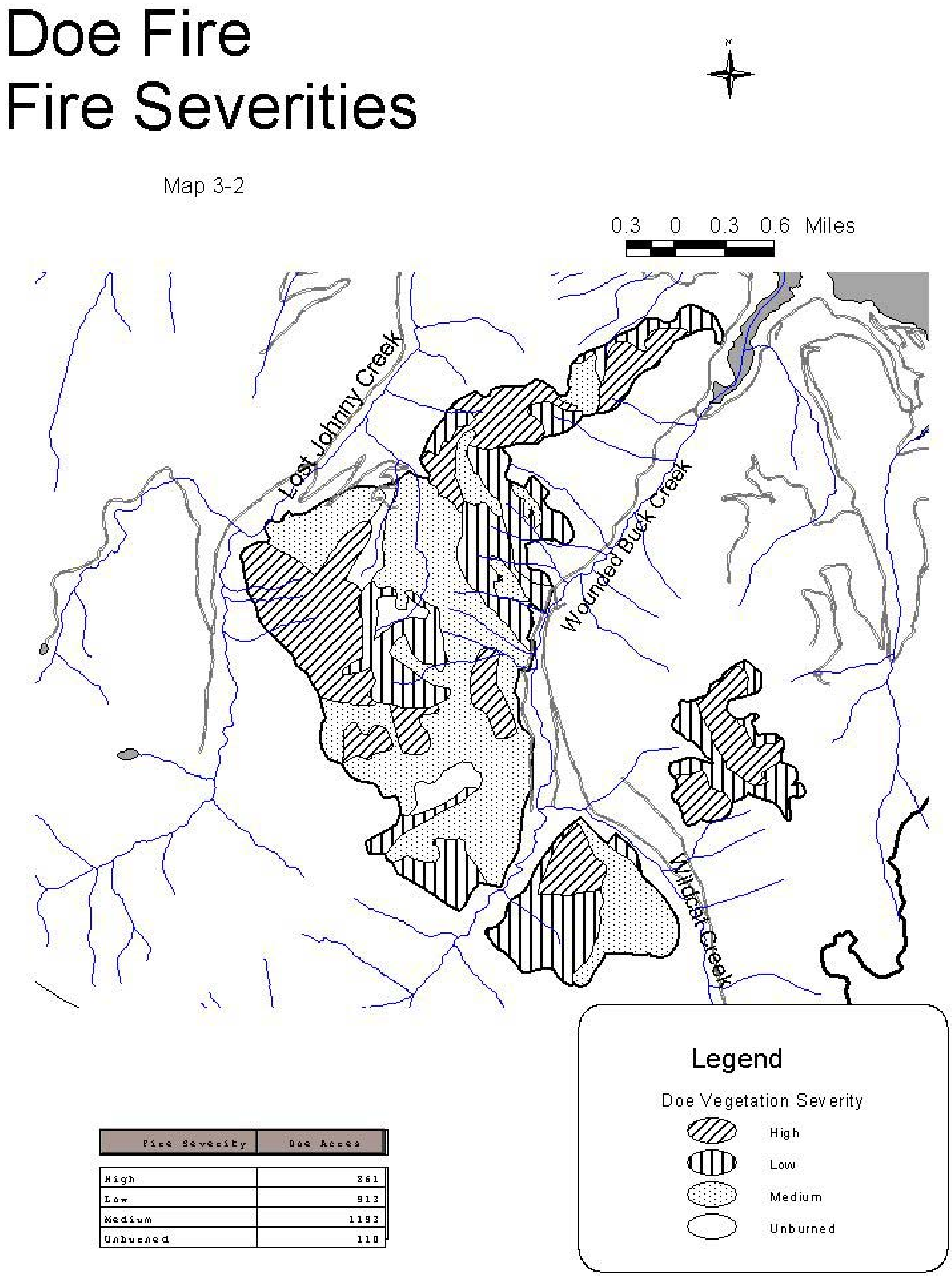
The understory reinitiation structural stage can develop over time as trees in the overstory begin to die, creating openings for sunlight to reach the forest floor, and making nutrients and water available to new vegetation. Seedlings then become established to create an understory layer *(ibid).* As the stand ages, this understory can eventually reach a height where, in conjunction with remaining overstory trees, a multi-storied stand dominated by larger, older trees in the upper canopy is created. This is referred to as a late seral, or old forest, stage. A young forest multi-storied structural stage represents stand development over time resulting

Figure 3-1: Beta-Doris Fire Fire Severities



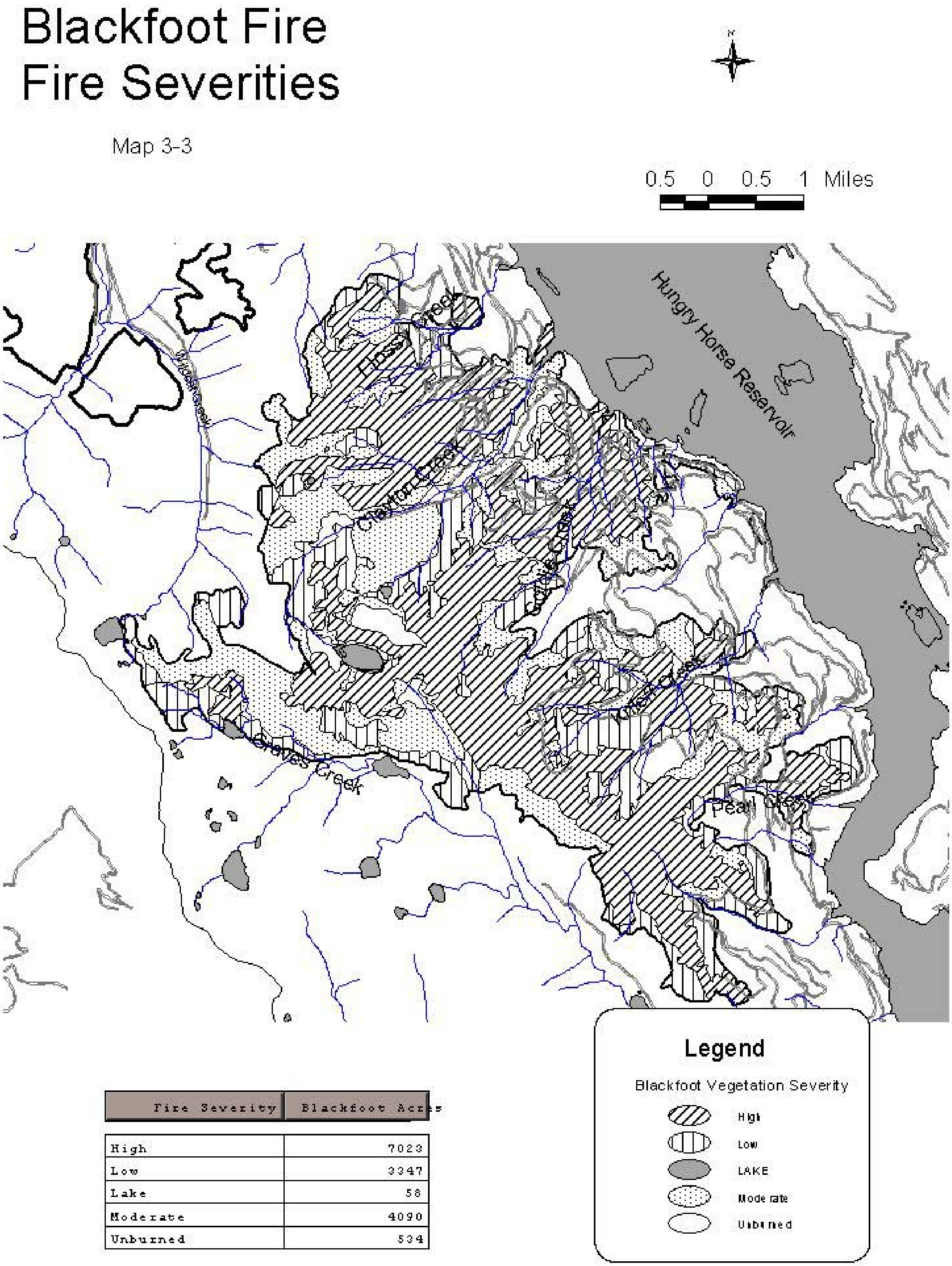
Fire Severity	Beta Acres
High	1377
Low	1029
Moderate	2387
Unburned	565

Figure 3-2. Post-fire fire severities



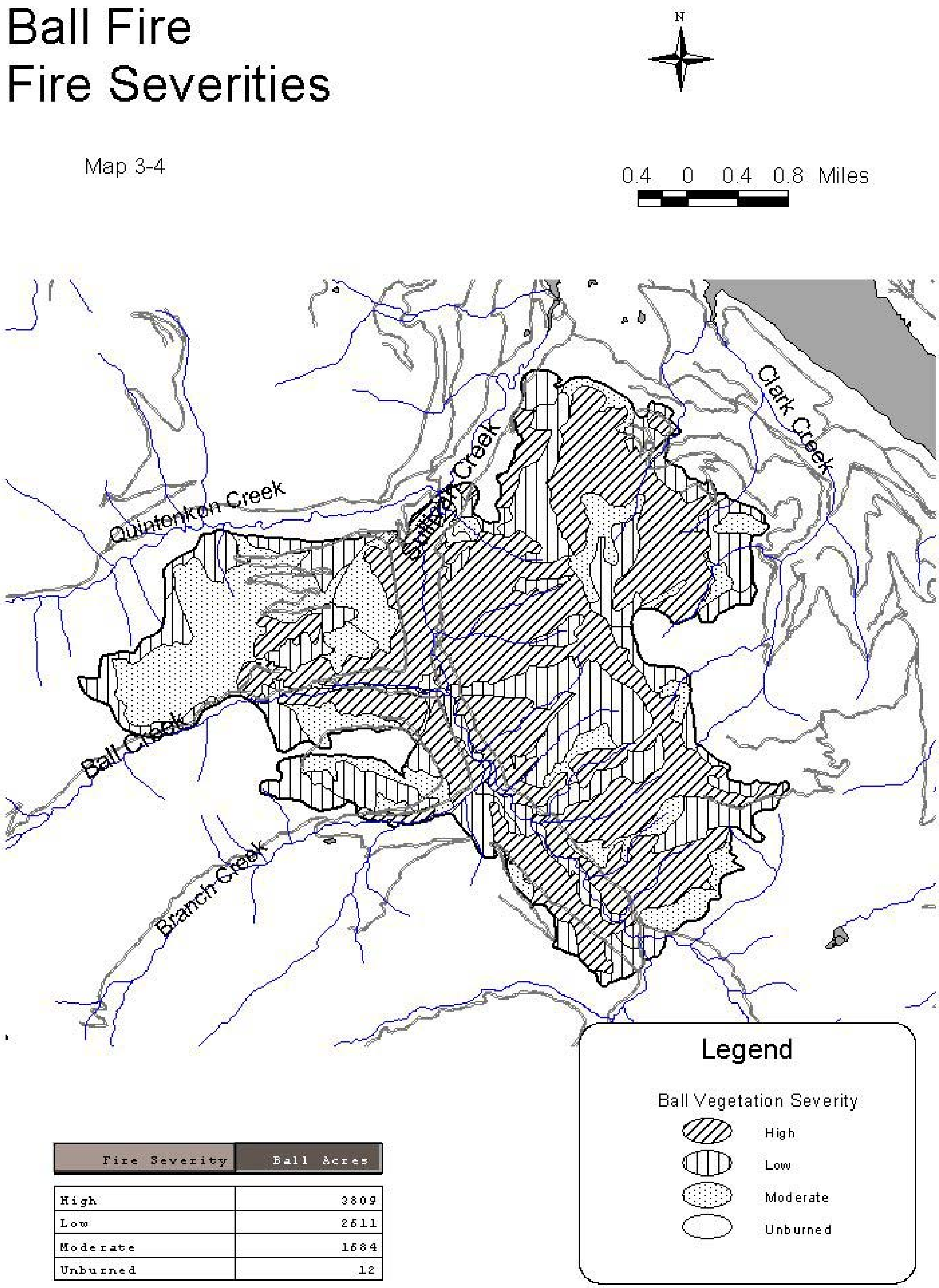
Fire Severity	Doe Acres
High	861
Low	913
Medium	1193
Unburned	110

Figure 3-3. Blackfoot Fire Fire Severities



Fire Severity	Blackfoot Acres
High	7023
Low	3347
Lake	58
Moderate	4090
Unburned	534

Figure 3-4. Ball Fire Fire Severities



Fire Severity	Ball Acres
High	3809
Low	2611
Moderate	1684
Unburned	12

from intermittent mortality to the overstory (i.e. fire, partial harvest, insect or disease). A forest dominated by trees of mixed sizes and canopy layers can result (Hessburg *et al.* 1999).

The fires of 2003, in combination with past harvest activities and natural disturbances have created a mosaic of stand structures across the landscape. Acres harvested in the last four decades were in the stem exclusion (sapling), understory reinitiation (thinned sapling/pole), or the stand initiation (seedling) stages at the time of the fires. About 13,944 acres of the area in the fires reverted back to a grass (stand initiation) stage while some vertical structure was retained by the standing stems (snags). The following table shows the amount of structure type affected by fire severity, within the four fires analyzed. Structure type is based on Oliver and Larsen's (1996) and Hessburg *et al.* (1999) stand development classification with local modifications that better define a late seral/old forest stage. The West Side Reservoir fires altered structure substantially, as displayed in Figures 3-5 and 3-6. The structure most affected by the fire was late seral. It also had the most acres that burned at the highest severity (Exhibit P-4). Post-fire structure for each of the fire areas is displayed in Figures 3-7 through 3-10.

Table 3-3: Acreage of pre-fire structure class affected by fire severity level within Beta-Doris, Ball, Blackfoot and Doe Fires *

	* Acres Affected by Fire Severity			
Structure	**High**	**Moderate**	**Low**	**Unburned**
Understory reinitiation	88	0	0	0
Stand initiation (seedling)	2943	2312	2668	440
Mid-seral	854	339	458	351
Late seral	8760	6421	4456	682

*Numbers are approximate due to GIS/satellite data processing and interpretation, rounding, water and rock.

Table 3-4: Existing Structure classes across West Side Reservoir Fire areas

Structure	Acres post-fire
Stand initiation	22307
Mid-seral	30
Understory reinitiation	6217
Late seral	1938

Figure 3-5.

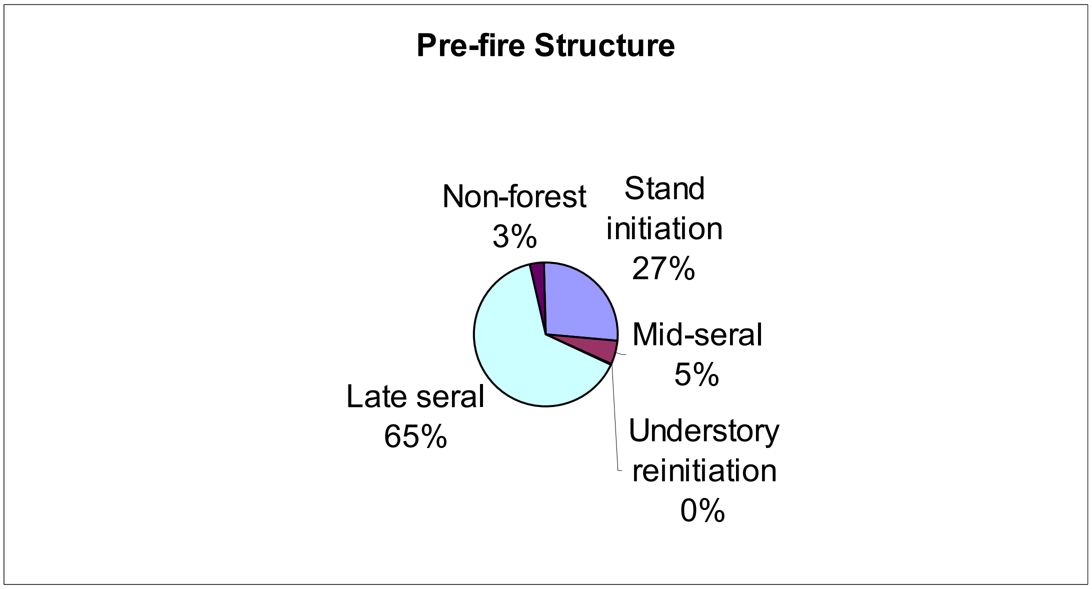


Figure 3-6

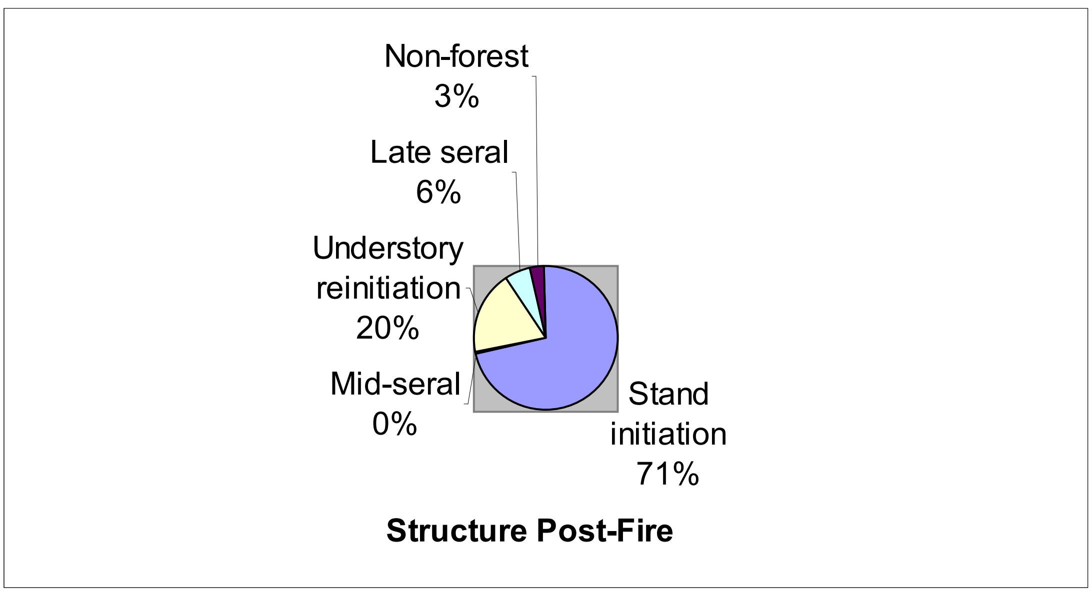


Figure 3-7: Post-fire forest structure within Beta Fires

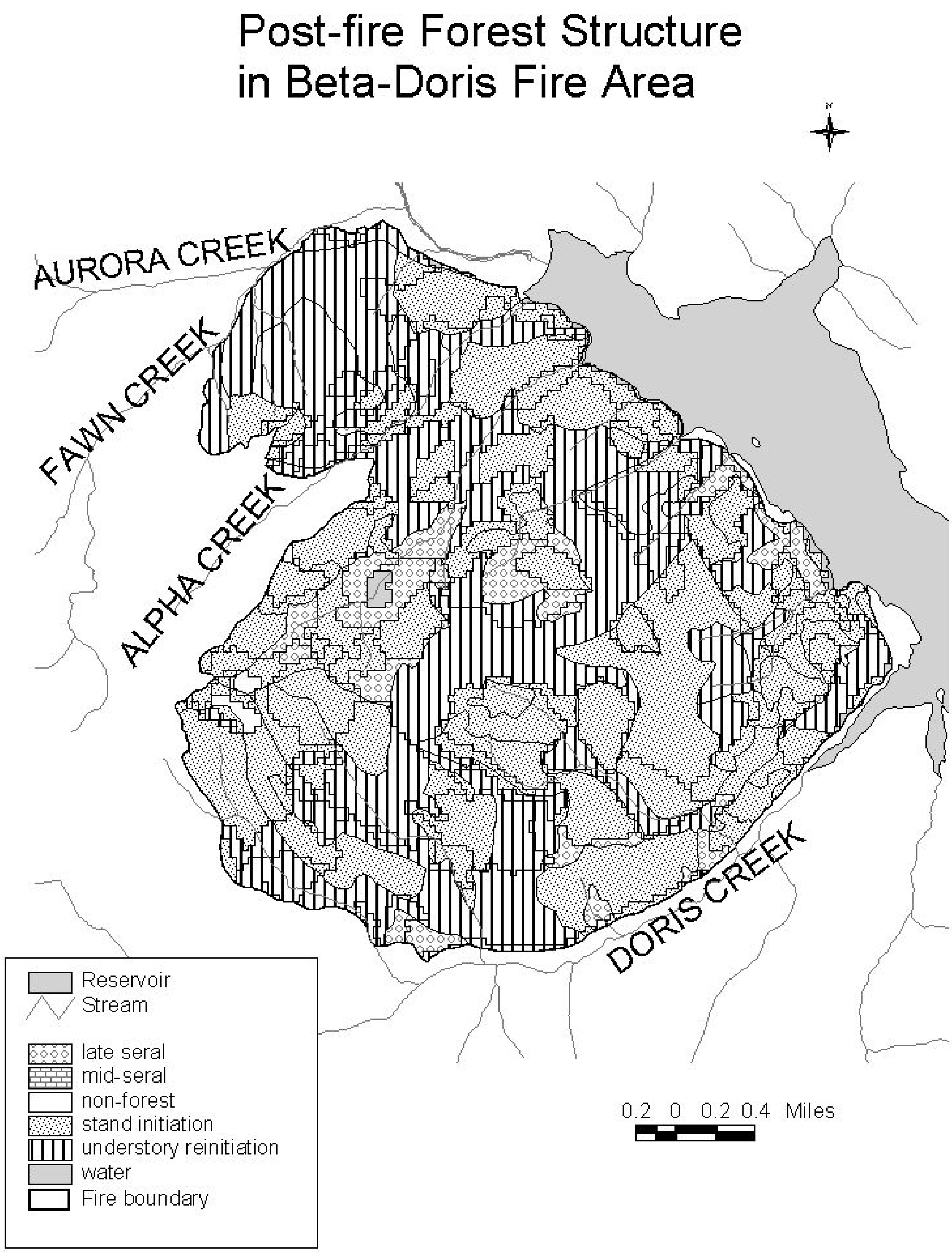


Figure 3-8. Post-fire structure in Doe Fire

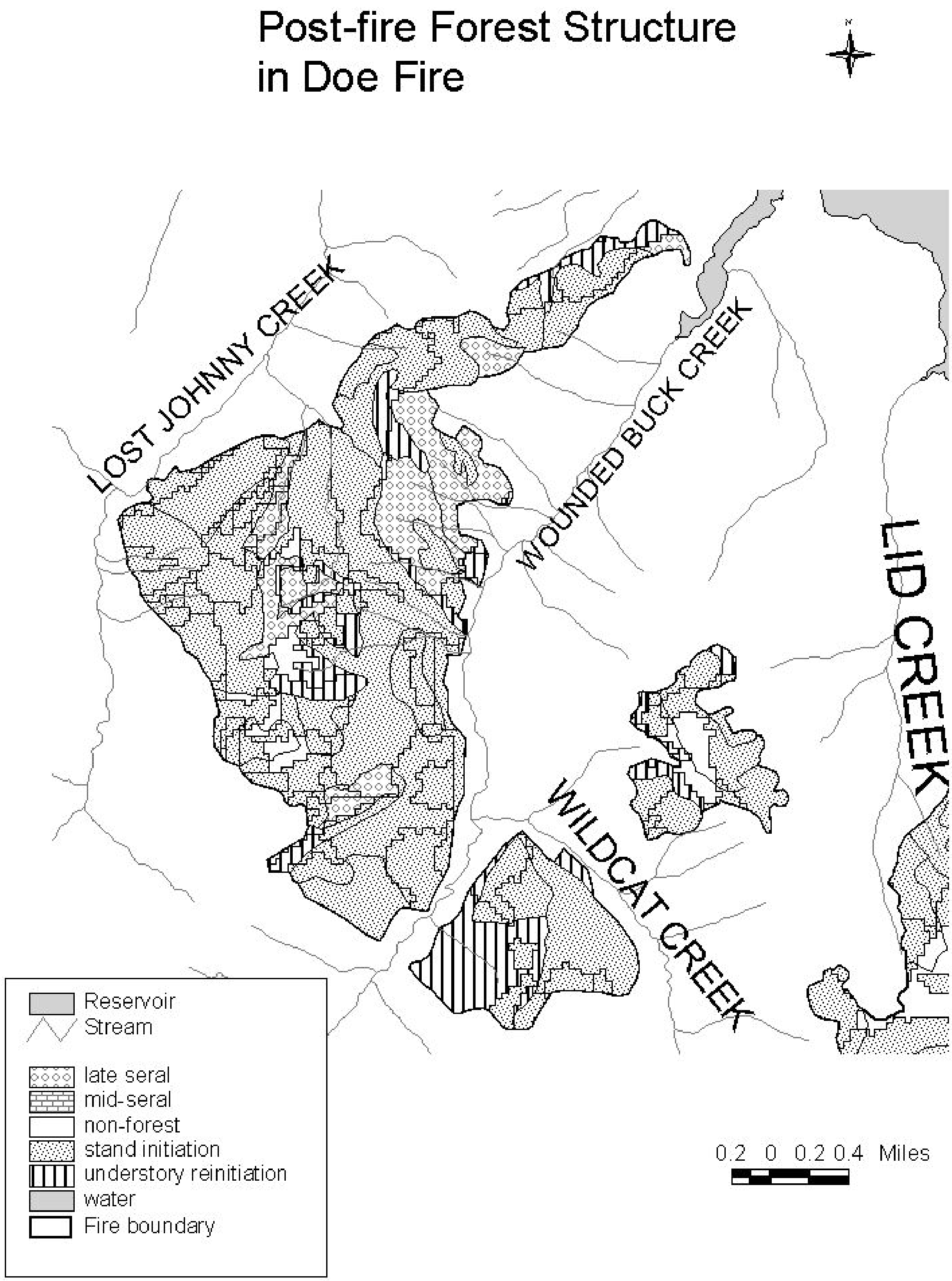


Figure 3-9. Post-fire structure in Blackfoot Fire

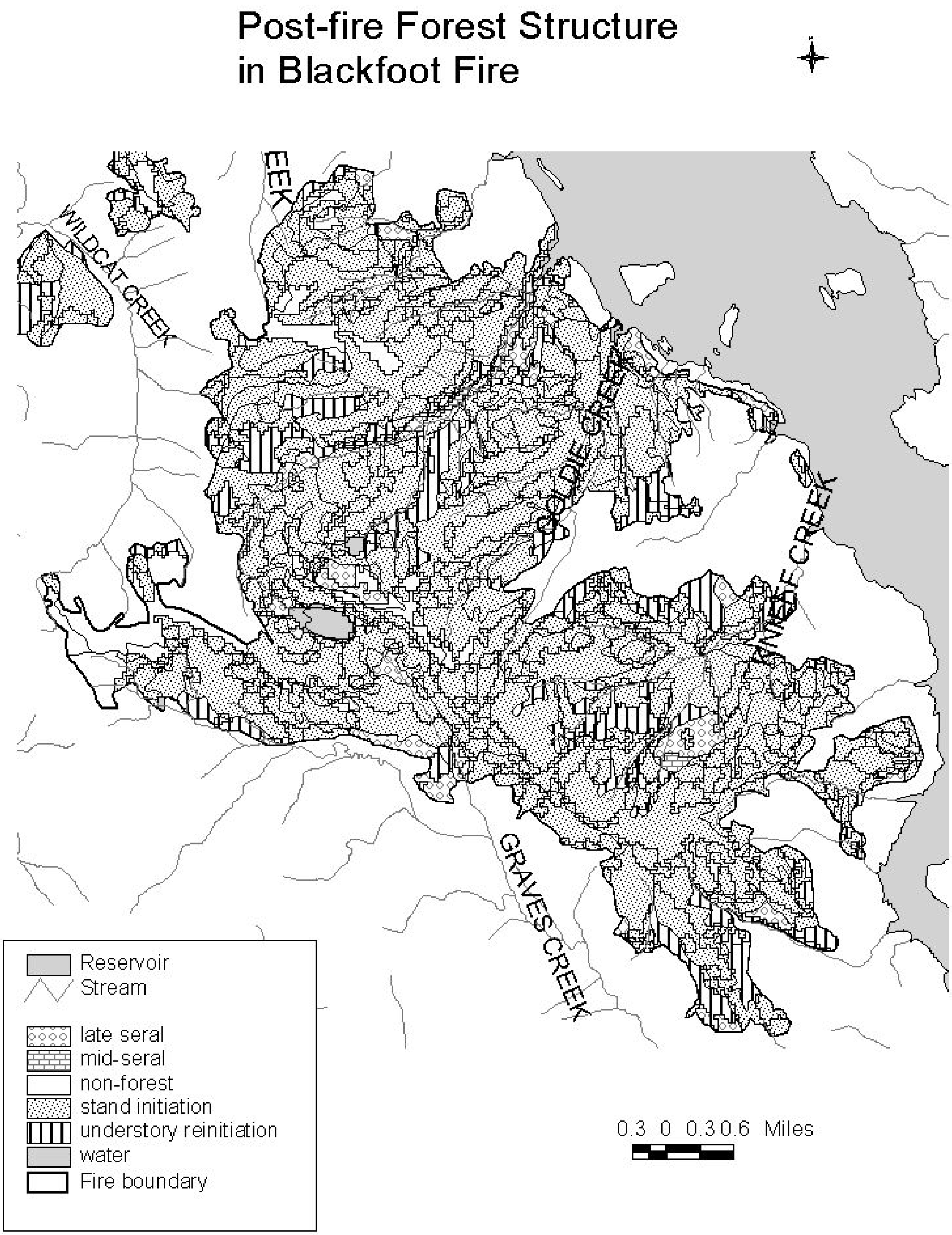
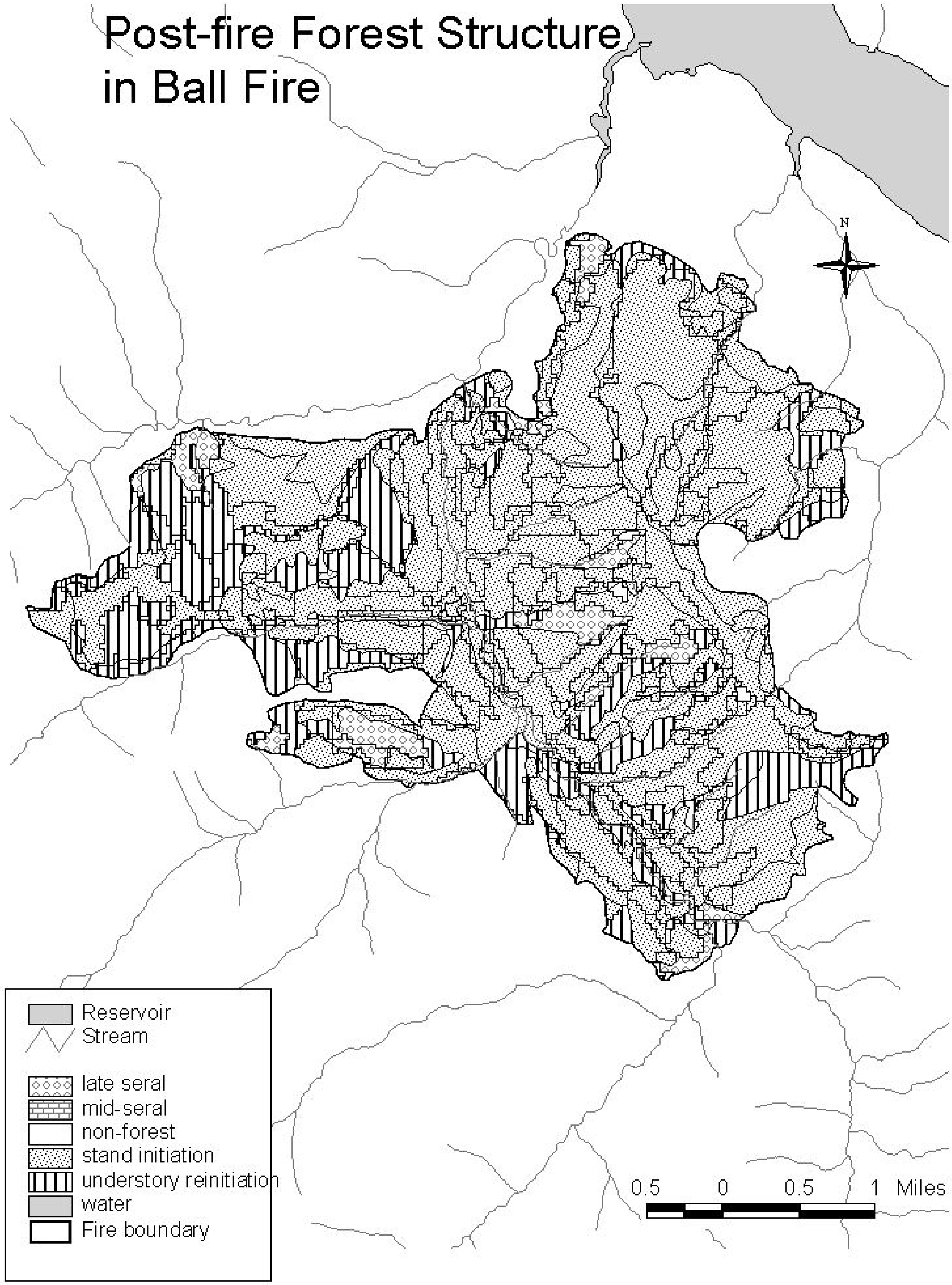


Figure 3-10. Post-fire structure in Ball Fire



Late seral/Old forest

Prior to the fire, it is estimated that late seral structural stages occupied about 64 percent of the area within the fires. The amount of late seral forest was greatly reduced by the fire. Overall, the late seral stands within the fire perimeters are approximately six percent. Many stands burned with a moderate to high intensity, and reverted to stand initiation stage. Other stands were reclassified as understory reinitiation. The understory reinitiation stage is characterized as having an overstory of low to moderate density, where gaps have been created due to mortality and blowdown, allowing an understory to become established. Some late seral stands retained their character and function if they experienced a light ground-fire and were mainly comprised of fire-resistant species such as western larch. Other late seral stands of spruce were changed by low severity fire to understory reinitiation, due to spruce's susceptibility to girdling by fire (Exhibit P-5).

The range of natural variability in the amount of late seral/old forest within watersheds of the South Fork is wide, occupying from zero to nearly 65 percent of the land area. This is to be expected considering the natural disturbance regime in moist, cool forests which is characterized by large, stand-replacing wildfires with long fire-free intervals (150+ years) (Exhibit P-3). This disturbance regime results in large patches of burned forest, converting many, if not most of the older forests in the watershed into a seedling/sapling stage of development. Over time, through natural succession, some of this would eventually develop into an old forest structure again with larger-diameter trees and multi-storied canopies.

Windthrow

Blowdown of the standing dead trees is a natural consequence after fires. Fall down rates vary by species and diameter (Everett *et al.* 1999). Fall down rates are lowest for western larch and subalpine fir (USDA 2000). Douglas-fir tree fall rates increase after five years, as the volume of decay increases in the lower stem. On the Sleeping Child burn in Montana, only 28 percent of lodgepole pine were still standing after ten years (Lyon 1984). Research (Harrington 1996) has shown that 75 to 80 percent of ponderosa pine trees that die in the first post-burn year will fall within ten years. Riparian areas within the fire areas have already experienced a great deal of blowdown, primarily among the mature spruce trees. Trees with extended use as snags will be those with moderate to low crown scorch that remain alive for at least two years after injury (ibid). Although a majority of trees will fall the first ten to 20 years, the trees that remain standing after that time may do so for a very long time (e.g. 50-70 years).

Deterioration of Fire-killed/Fire-damaged Timber

Relatively rapid deterioration of fire-killed or fire-damaged trees can be expected, causing a decline in its commercial value. Factors affecting the rate of deterioration are tree species, species characteristics, tree diameter, growth rate, age, site conditions, fire severity, and time of year. The agents affecting deterioration are insects, stand and decay fungi, and weather. Although the rates of staining and cracking (52% to 80% volume affected) are high the first five years, decay rates are much lower during the same time period (USDA 2000). Cracking allows the sapwood to dry out, retarding or arresting decay. This is more common in thin-barked species such as Engelmann spruce, subalpine fir, and lodgepole pine. Field surveys conducted in the summer of 2004 indicate that cracking and checking has already resulted in 20% to 30% volume reduction, mostly in smaller diameter trees.

Patch sizes

Immediately prior to the West Side Fires of 2003, the average size of a "patch" of forest of similar size and structure in the South Fork drainage was 70 acres, ranging from 5 to 9,616 acres. The larger patch sizes were a result of a lack of fires in much of the area for over 150 years.

The substantial amount of acreage affected by high intensity fire in 2003 reverted many acres back to the stand initiation stage. Based on GIS modeling, the 11,352 acre Blackfoot Fire is now the largest patch in the South Fork drainage. The shape is highly irregular and contains a mosaic of vegetation islands with varying structure and fire severities (Exhibit P-6).

Conifer Regeneration and Reforestation

Regeneration in previously managed stands

Within the fire boundaries, timber harvest dating from the 1950s to 1994 had occurred on about 6803 acres, or about 21 percent of the 31,450 acres burned by the West Side Fires (Exhibit P-7). Not all of those acres were treated with regeneration harvest. Many regenerated harvest areas within the fire area were severely impacted by the fire. About 745 acres that had regeneration harvest since 1981 were moderately or severely burned. Another 3366 acres that were harvested between 1961 and 1980 were moderately or severely burned. Planting seedlings on 1682 of those acres is planned for 2005 or 2006 (Exhibit P-8). Reforestation in areas previously harvested and subsequently burned by the 2003 fires is a high priority to meet the National Forest Management Act. Reforestation activities in these areas are already underway. Seedlings will be planted in the first two to three post-fire years before competition from pine grass, fireweed, and other early successional plants preclude successful establishment. White pine genetically resistant to blister rust had been planted in some harvested areas prior to the fire. Where possible, white pine would be replanted in these same areas.

Regeneration in other areas

There is a large body of data on post-fire regeneration based on local research conducted at the Miller Creek Demonstration Forest (Exhibit P-9). The research has consisted of short and long-term (up to 35 years) projects. From these data we are able to predict fire effects for the South Fork area. The initial community establishing in the fire area is expected to be grasses and shrubs. Their source will be from one of three components: survivor, residual colonizer or offsite colonizer (Stickney 1990). Trees may become established on a disturbed site in a number of ways, such as residual seed in the soil, from cones on trees that survived the fire, from seed that blows in from off-site, or from animal transport. Diverse natural conifer regeneration may be delayed or below desirable levels in some areas due to lack of seed source. It is likely that a majority of the fire area has surviving residual lodgepole pine seed in the soil. Other species such as especially larch will not become established unless a cone crop coincides with the first few post-fire years when the germination substrate is favorable (Shearer 1975). Some of the area with less than desirable regeneration may occur in the center of larger burn areas with complete mortality, or at upper elevations and south facing aspects where there are thin soils.

The length of time for natural revegetation on dry PVTs is expected to be slow and spatially discontinuous. Immediate post-fire species composition is largely dependent on seed dispersal from adjacent unburned areas, persisted through the fire, or resprouted from plant parts surviving the fire (DeBano *et al.* 1998). Native grasses and shrubs will colonize the burned areas (Noste and Bushey 1987). Although the tree component will be influenced by competition, generally the community that was present before the fire is the community that will return through successional (Stickney 1986). For example, ceanothus was present in some stands before the fire, and is expected to return, especially on south-facing slopes. A medium to severe wildfire on a dry-type Douglas-fir/ninebark habitat type with evergreen ceanothus seed in the soil will result in an evergreen ceanothus community.

The *Northern Region Overview Summary* categorizes the forest and rangeland *species at risk* for the Northern Rockies Zone as western white pine, western larch, ponderosa pine, upland grasses/shrubs and whitebark pine. They are considered most at risk in this zone due to "past and potential future loss in the aerial extent of the cover type; substantial changes in landscape level heterogeneity (fragmentation); substantial changes in structure (both density and change in distribution of structural stages); and susceptibility to spread of identified exotic plants."

There is a low probability for natural regeneration of western white pine due to the severity of the burn, lack of surviving seed source and the topography. Many areas have 90 percent mortality of the overstory, and very few cones of white pine have been observed thus far during field reconnaissance. Some white pine will be planted in previously harvested areas.

In some areas within the fire there are good cone crops and survivors of western larch, Douglas-fir, Engelmann spruce, and lodgepole pine. Abundant seedlings were evident this summer in many, though not all, areas. A recently burned soil substrate is a very favorable condition for tree seedlings, especially western larch, to become established; however, an abundant cone crop must occur within two or three years of the fire for larch to gain a foothold on a site. Good larch cone crops are produced at about five year intervals. Larch is an early seral species, highly intolerant of shade. If larch gets a late start on a site, it is often out-competed and out-shaded by shrubs and other conifer species (Schmidt *et. al.* 1976).

There are a few areas of high severity burn where distance to the seed wall exceeds 3000 feet. These areas may have lodgepole pine in the soil seed bank or already regenerating from cones opened by the heat of the fire, but species diversity will be lacking as these patches regenerate without other seed sources. This situation exists in the Blackfoot and Ball Fires.

The majority of the area burned by the fires occurred on lands classified in the Forest Plan as Management Area 15, where cost-efficient production of timber is emphasized, while protecting the productive capacity of the land and timber resources. Planting may be necessary on some MA 15 lands to restore the productive capacity of the land in a timely manner. Vegetation treatments are appropriate and expected on MA 15 lands.

Forest Plan resource goals include designing treatments to encourage development of diverse vegetation native to the site. Larch was historically a dominant species in the south half of the fire area, and much of the original mature larch component was taken out with harvest in the 1960s, 1970s and 1980s (Bollenbacher, personal communication). Encouraging this species before lodgepole pine or other species get a chance to choke it out would contribute to restoring the South Fork drainage to historical conditions.

Snags and Downed wood

The West Side Reservoir fires created approximately 23,000 acres of snags and downed wood in areas that had not been previously harvested in the South Fork drainage. The size of the snags differs greatly between areas that have experienced one or more fires during the last 150 years (approximately 2650 acres), and other areas that have not burned for 250 years or more (approx. 28,950 acres). Refer to the Snags and Downed Wood section in Chapter 3 for greater detail.

Access for forest management

The existing system of roads open yearlong, open seasonally, or closed with gates allow reasonable access (within one mile of a road) to 113, 580 acres of national forest system lands within the West Side analysis area.

Environmental Consequences

The analysis of direct, indirect and cumulative effects on vegetation is limited to the vegetation analysis area previously described (the four fire boundaries). The potential effects described below represent the result of analysis based on research, experience, and monitoring to date and best professional judgment of the silviculturist, fuels management specialist, wildlife biologist, regional entomologist, other interdisciplinary team members, and others in the professional community.

The direct, indirect, and cumulative effects of the proposed action or its alternatives would result mainly from the vegetation management activities described in Chapter 2. These activities primarily consist of salvage harvest of fire-affected trees and the regeneration of the harvest units to mixed conifer stands. The effects would vary among alternatives based on the acreage treated, as well as size and spatial distribution of the units. There were no substantial issues related to vegetation other than old growth, which is analyzed under the wildlife section (refer to Chapter 2). The following effects indicators were used to focus the vegetation analysis and disclose relevant environmental effects.

- Acres of salvage harvest
- Acres of reforestation
- Acres of natural successional development

- Change in access for future timber management
- Salvage harvest by structural stage (acres)
- Legacy areas remaining (acres)

Other impacts addressed in the vegetation effects analysis include: late seral forests, blow-down, conifer regeneration, and timber resource. The following effects indicators will be addressed in detail in separate subsections in this chapter.

- Potential for insect-caused mortality
- Sensitive Plants and Noxious weeds
- Fire and Fuels

Direct and Indirect Effects

<u>Alternative A (No action)</u>

Timber Resource

There would be no salvage or fuel reduction with the no action alternative. Deterioration of dead timber would be most noticeable within two years of the fire. Drying and splitting of the heartwood (checking) is a major cause of deterioration. Subjecting wood to rapid drying, which occurred in areas that burned at high intensities, causes checking. Checking will increase as a result of long periods of dry weather. Insect attack usually precedes fungal attack and provides the mechanism for introducing microorganisms that accelerate sapwood deterioration. Many variables influence deterioration, and volume and value lost vary by species (USDA 2000). Each stand is unique and each tree is unique. Blue stain will appear in the pines within the first year. By the second year, some of the sapwood will be decayed. After three years, the sapwood of most softwood species will have deteriorated beyond practical use. Fifty percent of the volume may be lost in Douglas-fir trees 11-20 inches DBH by year three (Lowell et al. 1992).

The decomposition rate is about half of that of production in western Montana. Based on principles of energy systems in the Northern Rocky Mountains, the timber resource is at risk if neither fuel management nor fuel reduction activities are scheduled (Beaufait 1971).

Natural Successional Development

In this alternative, no vegetation management actions would be taken, but species and community biodiversity will return through succession, natural revegetation, and recolonization processes. The early successional stage of vegetation (stand initiation) over most of the area will consist of shrubs, perennial herbs and grasses that resprout. Germination can be expected from those plants, including conifers, whose seeds survived the fire or disseminated from offsite sources. On north facing slopes with limited conifer seed sources, shrubs may out-compete conifers if no artificial regeneration occurs. On some south-facing slopes, pinegrass will quickly become established and can also out-compete seedlings. High-intensity fires in pure lodgepole pine stands usually result in a new stand of pure lodgepole pine. The high biotic potential in seed stored in serotinous cones is important in the establishment of extensive areas of pure, dense, lodgepole pine (Lotan, Brown & Neuenschwander 1984; Volland 1984). Without the artificial reintroduction of other species on these sites, overstocked stagnated stands of lodgepole is often the eventual result, as witnessed in areas unplanted after the 1988 Red Bench Fire in the North Fork of the Flathead River.

Establishing seral species of trees is important to maintain ecosystem stability and to prevent type conversion to noxious weeds, shrub fields, or climax species. Where needed, planting of seedlings in areas that had been harvested prior to the fire will occur regardless of this proposal or its alternatives.

In most of the fire area, tree species will return to the area through germination of seeds in the soil and/or from trees in unburned or adjacent areas, and some species will resprout. In general, conifers produce seed at irregular intervals, which varies by species. The West Side Reservoir fires, in conjunction with past harvesting, left extensive areas without seed trees, and natural regeneration is expected to be a slow process. Regeneration is greatly increased in areas where dead trees are left standing to provide shade (Shearer 1976). The period of time required for the area to return to a forested ecosystem will depend on many factors including, but not limited to:

- Site conditions and productivity
- Burn severity
- Future fires and their extent and intensity
- Weather patterns
- Proximity of seed sources
- Seed dispersal events

Stands that experienced a high-severity fire, or even a moderate-severity fire, now provide growing space for plant life. Western larch favors a germination substrate where fire has reduced both the duff layer and sprouting potential of competing vegetation (Shearer 1975). However, in the first four or five years, shrubs and herbs will dominate the site. Common species include fireweed, spirea, beargrass, and grass species. Eventually, the growing space is completely occupied by plants. In about 15 to 25 years after the disturbance, the more competitive plants and tree species exclude others from colonizing and take over the growing space of the less competitive species. As development progresses, in 80 to 100 years, overstory trees may dominate the site completely (stem exclusion). Shrubs and trees that invade the understory grow very slowly in height for many years and form advanced regeneration (understory reinitiation).

The next successional stage may occur after about 150 years, provided it is not altered by another major disturbance. This stage (understory reinitiation or young forest multi-story), characterized by two or more layers of trees, but not dominated by large, old trees, may last many decades. Barring large partial or stand-replacement disturbances, the forest continues to grow until gradually some of the overstory trees begin to die. As they die, understory trees often grow to become the overstory. The result may be a stand structure with many layers of foliage, a diversity of tree sizes but dominated by large older trees, large snags and downed woody material. As tree diameters increase and senescence begins, the stand evolves into what is known as late seral or “old growth”.

In light fire-severity stands, the fire directly killed a portion of the vegetation. Initially there is the appearance of greater survival, but due to the susceptibility of Engelmann spruce and subalpine fir (very thin bark) to heat, subsequent mortality is impending (Miller 2000). In the next year, crown canopy will decline and continue at a reduced rate for the next four or five years. This may be described as a partial disturbance. In this case, patches of growing space are available, and newly established species such as Douglas-fir, subalpine fir, spruce, and lesser amounts of shade-intolerant larch and lodgepole pine undergo similar changes to those described above for stands with complete disturbance. The invading individuals compete with other plants and trees that survived the fire. The species composition of conifers will be greatly influenced by site factors (Shearer 1976). These light fire severity stands will progress in a manner similar to the slightly more open grown stands.

Snags and Downed Woody Material

Personal-use firewood cutting aside, which is not possible to quantify, all dead downed woody material will be left on site providing a high degree of ecological integrity by leaving the community of soil and decomposer microorganisms intact. The large number of snags and subsequent logs remaining after the fire will provide habitat and contribute to soil productivity (Harvey et al. 1987).

Blowdown can be anticipated over the course of time. In a study in similar upper montane subalpine forest types, 85 percent of the snags fell in the first 13 years, and 93 percent had fallen in 21 years (Lyon 1984). However, in this study, the majority of species were lodge-pole pine. There are a variety of species in the drainage, as described earlier in the affected environment section. The large woody debris recruitment for this process is important for stream health, wildlife habitat, and nutrient cycling. This topic is covered in depth in the snags and woody debris section of this EIS.

Forest Structure

The no action alternative will not change the amount of area in any of the structural classes in any fire severity class as previously described in the vegetation affected environment section. As mentioned under the snag issue, blowdown is inevitable. In terms of standing dead trees, the vertical structure in high intensity burn classes would change dramatically over the next 10 to 20 years. In stands near ridgetops with predominantly subalpine fir, spruce, and lodgepole pine, and where the average diameter is less than 10” DBH, blowdown can be expected in ten years rather than twenty. In low intensity burn classes, delayed mortality will allow these areas to stand longer; however, in twenty years the majority of dead trees will have blown down.

Access for future timber management

Within the analysis area boundary, there are presently 245 miles of road open yearlong, seasonally, or gated, to access forest stands. These roads provide reasonable management access (within one mile) to 113,580 acres of forest.

Alternative B

Timber Resource

Wildlife snag prescriptions have reduced the acreage in several units by 15 or 25 percent. With wildlife snag prescriptions applied, Alternative B, the proposed action, would salvage 4908 acres within the West Side Reservoir fires. Most of the area is within the suitable timber base and is physically and economically feasible to salvage. Approximately 50 million board feet of timber volume would be harvested. Acreages within the fire not considered for salvage were primarily areas previously harvested, on unsuitable ground, small diameter unmerchantable timber, or areas too far from a road to make helicopter yarding possible or economically feasible. Chapters 1 and 2 of this EIS describe how the proposed action was developed and why certain areas were included for treatment. Alternative E includes the same vegetation treatments as Alternative B, but considers different road management options.

The proposed action was designed to salvage fire-killed timber while leaving snags and woody debris sufficient to maintain ecological processes that protect ecosystem function.

Alternative B would salvage harvest approximately 4908 acres within 130 harvest units. Units vary in size from 1 to 263 acres. This alternative would salvage only dead trees and trees most likely to die because of severe fire injury or beetle-infestation (refer to Post-Fire Mortality Guidelines in Appendix B). In units requiring a skyline yarding system, some live trees may have to be cut to access portions of the unit. The intent of the project is to avoid removal of any trees likely to survive the effects of the fire, using the mortality guidelines described in Appendix B.). Further, timber salvage is appropriate in most of the management areas within the fire areas.

Minimal post-salvage slash treatments are anticipated, though some fuel reduction may be necessary in units where accumulations of woody debris would inhibit regeneration and create a fuel hazard (refer to Appendix A for treatment descriptions). Jackpot burning would be preferred over grapple piling, to minimize impacts on the soil. The intent is to balance the objective of leaving remnants of the fire while reducing the hazard level if another fire should start.

Riparian habitat conservation (RHCA) guidelines described in Chapter 2 apply to this and all action alternatives. No salvage harvest would occur in these RHCAs.

Where seed sources are available, germination of lodgepole pine, larch, and Douglas-fir have a high potential for success if adequate cone crops exist due to the ash seedbed created by the fire (Schmidt et al. 1976; Miller 2000). Regeneration surveys would monitor this process. If natural regeneration is inadequate to meet stocking guidelines, planting would augment these areas. Conifer seedlings would be planted on approximately 1340 acres and natural regeneration is anticipated on 3566 acres of treated units. Regeneration surveys subsequent to salvage would be performed to determine the success of natural regeneration as well as the planting. A variety of conifer species would be planted to add to the diversity of the early successional vegetative community. Planting also ensures diversity in what otherwise might develop into an overstocked monoculture of lodgepole pine trees. Future generations may then have options and a useable resource for wood fiber if they so choose, as expressed in the National Forest Management Act (NFMA).

Regeneration success on the nearby Little Wolf Fire of 1994 has been very high. All harvest units (1175 acres) included in the fire salvage in Little Wolf have been certified as fully stocked (Exhibit P-12). The spruce beetle control units (1213 acres) have also regenerated.

Natural Successional Development

Natural successional development would occur on 30,260 acres (95.7%) of the approximately 31,600 acres of the fires. Even where seedlings are planted, growing space will still be available for herbs and grasses to become established. Long-term site productivity will not be adversely affected due to the abundance of coarse woody debris prescribed for all units. The removal of dead trees from salvage units would not keep natural successional development from occurring; especially when winter logging of ground-based units is required. Little damage to new seedlings would be expected with helicopter and cable yarding methods. There are 622 acres proposed for ground-based logging, and 106 acres of that would be planted with varying combinations of white pine, larch, Douglas-fir, or spruce. The 516 acres proposed for natural regeneration in ground-based units are adjacent to seed walls or would have islands of residual live trees left to provide a seed source for regeneration. In general, areas with bare soil and a nearby seed source can be expected to become overstocked anyway (Shearer 1989).

Snags and Downed Woody Material

Snag emphasis levels vary across the fire areas, depending on amounts of snags in the general vicinity, adjacency to other units, riparian areas, and whether the area had functioned as old growth prior to the fires. For a full discussion of snag guidelines for each fire, see snag and downed woody habitat analysis under the wildlife section.

Larger snags are left to serve a variety of ecological functions, including wildlife habitat, woody debris recruitment for nutrient cycling and long-term site productivity, and a degree of structural integrity. These will usually be the larger windfirm western larch or Douglas-fir. Unmerchantable trees with deep char or less than 8 inches DBH would be left. Some trees may be pushed over during harvest operations for logging access or safety reasons, or felled for helicopter operations safety. The remaining smaller-diameter leave trees will likely remain standing for five to ten years. Large diameter Douglas-fir and larch have the potential to remain standing for a considerably longer period of time, depending on the degree of stem char. Residual trees in tractor units will be distributed throughout the harvested units in clumps or as isolated trees. Chapter 2 alternative descriptions and Appendix A describes treatments by stand groups.

Access for future timber management

Implementation of Alternative B would require the removal of 49 miles of road from the forest system to meet grizzly bear security requirements. Reasonable and economical access to 15,089 acres of forest for resource management would be lost with the implementation of the road decommissioning (Exhibit P-13). Future timber harvest in areas where roads have been decommissioned would require logging systems that can economically operate farther away from existing roads, such as helicopter or forwarder, or reconstruction of decommissioned roads or construction of new roads. Logging systems such as helicopter or forwarder are more expensive than many other logging systems and could affect the financial viability of future sales. Reconstruction of decommissioned roads or new roads would also be an expense that would likely be borne by future timber sales, and could also affect financial viability.

Alternative C

Alternative C was designed to respond to issues and concerns regarding the wildlife habitat, riparian areas, sensitive soils, and previous old growth habitat. Units were eliminated or modified to respond to these resource concerns. No salvage harvest in previous old growth areas that burned at a low or moderate severity is included in this alternative. Vegetation effects from this alternative are essentially the same as those described for Alternatives B, with the exception of effects to 976 acres. Standing snag structure in previous old growth would not be altered, allowing for higher levels of natural downfall and buildup of coarse woody debris.

Timber Resource

This alternative would recover 35 million board feet from 3931 acres, 15 million board feet less than Alternative B. The prescriptions for treatment remain the same as Alternative 2. Regeneration through planting would occur on 1205 acres, leaving 30,396 acres (96%) of the fire areas to naturally regenerate. Although regeneration is greatly increased in areas where dead trees are left standing to provide shade, monitoring of reforestation in areas where salvage harvest occurred will ensure regeneration is adequate. Planting will be scheduled if stocking levels are below prescription by year three or five.

Access for timber management

This alternative would remove 69 miles of road from the forest system to meet grizzly bear security requirements. It has a slightly different combination of roads than Alternative B. Reasonable and economical access to approximately 95,090 acres of forest for resource management (planting, thinning, timber stand inventory, insect and disease monitoring, harvest, etc.) would be affected with the implementation of the road decommissioning (Exhibit P-13), with affects essentially the same as those described for Alternative 2.

Alternative D

Alternative D was designed to respond to the issue of maximizing the recovery of burned timber while maintaining forest plan standards. Snag retention patches would be 15 percent of original unit size in all units over 20 acres, rather than a combination of 15 percent and 25 percent as in Alternative B. Additional road closures in this alternative make the riparian units unnecessary, as well as the 200 foot roadside buffer along open roads. This reduces the volume per acre of the total sale.

Timber Resource

This alternative would treat 5295 acres with a combination of helicopter, cable and ground logging systems. Approximately 50 million board feet of timber would be salvaged if implemented in a timely manner. No harvest would occur in winter. Ground yarding systems (662 acres) would employ rubber-tired skidders and/or forwarders, operating on a slash mat where soil conditions are a concern. This alternative calls for 3813 acres of helicopter yarding.

Natural Successional Development

Natural successional development (i.e., no planting after salvage) would occur on 3832 acres of the 5295 acres proposed for salvage. Even where seedlings are planted, growing space will still be available for herbs and grasses to become established. Long-term site productivity will not be adversely affected due to the abundance of coarse woody debris prescribed for all units. The removal of dead trees from salvage units would not keep natural successional development from occurring. The acres proposed for natural regeneration are adjacent to seed walls or would have islands of residual live trees to provide a seed source for regeneration. Ground-based units would be harvested in winter, where a blanket of snow affords protection to new seedlings. Very little damage to new seedlings would be expected with helicopter and cable yarding methods, which account for 88 percent of the units.

Snags and downed woody material

Snag emphasis levels vary across the fire areas, depending on amounts of snags in the general vicinity, adjacency to other units, riparian areas, and whether the area had functioned as old growth prior to the fires. For a full discussion of snag guidelines for each fire, see snag and downed woody habitat analysis under the wildlife section.

Larger snags are left to serve a variety of ecological functions, including wildlife habitat, woody debris recruitment for nutrient cycling and long-term site productivity, and a degree of structural integrity. These will usually be the larger windfirm western larch or Douglas-fir. Unmerchantable trees with deep char or less than 8 inches DBH would be left. Some trees may be pushed over during harvest operations for logging access or safety reasons, or felled for helicopter operations safety. The remaining smaller-diameter leave trees will likely remain standing for five to ten years. Large diameter Douglas-fir and larch have the potential to remain standing for a considerably longer period of time, depending on the degree of stem char. Residual trees in tractor units will be distributed throughout the harvested units in clumps or as isolated trees. Chapter 2 alternative descriptions and Appendix A describes treatments by stand groups. Dead standing snags can be beneficial to the establishment of young seedlings by providing intermittent shade (Shearer 1976). See wildlife section for more complete analysis.

Access for timber management

Implementation of this alternative would decommission 69 miles of road in the West Side Reservoir area, leaving 149 miles of road open year-round, seasonally, or gated. This would eliminate reasonable and economical access to approximately 18,490 acres in the watershed for managing the vegetation resource (Exhibit P-13). Planting, thinning, timber stand inventory, and /or timber harvest would all have substantially increased costs.

Alternative E

Alternative E was designed to respond to the issue of maximizing the recovery of burned timber while maintaining forest plan standards, but applies a different travel management scenario. Because it would maintain a greater number of open roads, harvest is included in some roadside riparian areas for resource protection. Snag retention patches would be 15 percent of original unit size in all units over 20 acres, rather than a combination of 15 percent and 25 percent as in Alternative B. This makes some units larger than proposed in Alternative B.

Timber Resource

This alternative would treat 5295 acres with a combination of helicopter, cable and ground logging systems. Approximately 56 million board feet of timber would be salvaged if implemented in a timely manner. No harvest would occur in winter. Ground yarding systems (662 acres) would employ rubber-tired skidders and/or forwarders, operating on a slash mat where soil conditions are a concern. This alternative calls for 3863 acres of helicopter yarding.

Natural Successional Development

Natural successional development (i.e., no planting after salvage) would occur on 3868 acres of the 5295 acres proposed for salvage. Even where seedlings are planted, growing space will still be available for herbs and grasses to become established. Long-term site productivity will not be adversely affected due to the abundance of coarse woody debris prescribed for all units. The removal of dead trees from salvage units would not keep natural successional development from occurring. The acres proposed for natural regeneration are adjacent to seed walls or would have islands of residual live trees to provide a seed source for regeneration. Ground-based units would be harvested in winter, where a blanket of snow affords protection to new seedlings. Very little damage to new seedlings would be expected with helicopter and cable yarding methods, which account for 87 percent of the units.

Snags and downed woody material

See discussion of effects from Alternative D. Within 200’ of open roads, snags would be harvested, as they would not be expected to persist, due to firewood cutting.

Access for timber management

Implementation of this alternative would decommission 49 miles of road in the West Side Reservoir area, leaving 167 miles of road open year-round, seasonally, or gated. This would eliminate reasonable and economical access to approximately 15,089 acres in the watershed for managing the vegetation resource (Exhibit P-13). Planting, thinning, timber stand inventory, and /or timber harvest would all have substantially increased costs.

Direct and Indirect Effects of Action Alternatives on Succession, Structural Distribution, Fire severity class, and Blowdown

Stand level

Stand level effects are described in the stand group table in Appendix A. Table 3-5 displays the acreages of structure classes affected by Alternative across the landscape. It is important to note that the lightning-caused fires of 2003 were the disturbance that initiated a new pioneer or early seral stage of succession. Some stands that had been functioning as late seral received enough mortality that they are now in early succession, or seedling, stage. The action alternatives affect succession to the extent that planting conifers in harvest areas hastens the revegetation process. Planting seedlings does not inhibit or prevent natural regeneration. Salvage treatments in the alternatives do not change the successional stage, because only dead and dying trees are proposed for harvest (as has been addressed in Appendix B Post-fire mortality guidelines, it is acknowledged that there may be some trees that are removed that would otherwise live, and some trees that are left that may die).

The potential for blowdown in harvest units is greater because the areas are more open and less trees and canopy are left for wind protection. The edge created by harvest will contribute to blowdown, but will be mitigated somewhat by residual standing snags and unmerchantable trees. Potential for blowdown is a function of species, diameter, landtypes/soils, elevation, and wind patterns. Deep-rooted species are western larch and Douglas-fir. Shallow –rooted species include spruce, subalpine fir and lodgepole pine. Dense stands of trees that have developed together over long periods of time mutually protect and support each other and do not have roots and boles to withstand exposure to wind if opened drastically. Residual live trees may develop windfirmness over time. Predicting when residual trees would blow down with or without harvest is difficult, but residual trees in harvest units can be expected to come down sooner than those in unmanaged stands because of increased exposure to wind. As stated earlier, research (Lyon 1977; Harrington 1996) has shown that most fire-killed trees are on the ground within ten to twenty years regardless of adjacency to salvaged trees, so blowdown patterns are not greatly influenced over the long term.

In stands with low to moderate fire severity, the distribution of mortality is highly variable. Consequently, harvest of dead trees would leave stands with irregular forest structures. Gaps or patches of openings would be interspersed with live green trees from sapling, pole, and mature size classes. A mixture of live green trees of all sizes, small-diameter dead trees, and large-diameter snags would represent the residual structure. Residual canopy cover would be greater than in stands with high fire severity.

Some green trees may be damaged (bark skinning) during harvest operations. Skid trails and skyline corridors would be located to minimize damage to green trees. Residual cone-bearing trees will provide a seed source for natural regeneration in these less intensely burned stands. Areas that experienced ground fire may provide site preparation and the germination substrate for natural regeneration.

The potential for blowdown within harvest units in less intensely burned stands is relatively less than in the more intensely burned stands. Stands will be opened up through the removal of dead trees, but green trees are more root-firm and likely to stand. This is not to say blowdown would not happen. As mentioned earlier, elevation, wind patterns, landtypes, and species contribute to the potential for windfall. In addition, open stands with mature trees with full crowns intercept wind better than burned crowns. In time, green trees would develop windfirmness, improving their ability to stand. Delayed mortality can be anticipated after harvest activities due to cumulative stress caused by the fire and climatic conditions. The trees affected by delayed mortality would contribute to future blowdown.

Landscape Level

Direct and indirect effects of the action alternatives on vegetation diversity and ecological processes will be evaluated through quantifying the amount of various communities and their characteristics (structure and fire severity classes) across the landscape. The analysis will focus on the condition of the forest communities, burned or unburned, that would result from the proposed activities and the effect they will have on future forests. It is important to remember that remnants of the pre-fire condition are present in the vertical arrangement of the burned vegetation (structure).

The importance or relevance of examining structure, especially with regard to burned forest, lies in the precept that ecosystem function is a consequence of structure. If the West Side Reservoir Fire landscape is to function to the extent that burned landscapes have in the past, then a substantial representation of the burn should remain undisturbed. The degree to which alternatives provide for a fully functioning ecosystem is a measure of how well overall ecological integrity might be maintained. The amount of structural class disturbed by the fire and left untreated are the legacy acres.

Although this post-fire harvest affects snag structure, it does not affect the successional structural class. The vegetative structure classes assigned are based on living trees, and the salvage is intended to remove only a portion of the dead and dying trees within the fire (as has been addressed in Appendix B Post-fire mortality guidelines, it is acknowledged that there may be some trees that are removed that would otherwise live, and some trees that are left that may die). Amounts of structural class affected by alternative are shown in the tables following (Exhibit P-14).

Table 3-5: Salvage harvest acres by structural stage for action alternatives.

Class Structural	Post-fire Structure acres	HARVEST ACRES AND % OF POST-FIRE STRUCTURE TREATED			
		Alternative B	Alternative C	Alternative D	Alternative E
Stand initiation	22,307	3117 (10%)	2777 (12%)	3379 (15%)	3400 (15%)
Mid-seral	30	0 (0%)	0	0	0
Understory reinitiation	6217	1555 (25%)	1070 (17%)	1673 (27%)	1700 (27%)
Late seral	1938	232 (12%)	83 (4%)	238 (12%)	238 (12%)

This table includes only national forest acres in the fire perimeter.

Varying amounts and distributions of structure are left as legacies across the landscape in each alternative. Smaller diameter trees and unmerchantable trees will leave some structure in harvested areas. All alternatives will meet Forest Plan requirements for snags and downed wood.

Late Seral/Old Forest:

No areas mapped as functioning old growth will be treated with this proposal. Ground-truthing in some units included in this DEIS is expected to reveal mortality upwards of 80 percent in the mixed conifer stands. Fire severity in the majority of a stand alters the functioning structure of the stand from late seral to understory reinitiation. Portions of stands with low severity fire and functioning late seral habitat will not be included in unit boundaries.

Fire Severity

Another component of the West Side Reservoir fires that provides a measure of the effects of action alternatives is the number of unharvested acres in each fire severity class, where no additional ground disturbance would occur from salvage activities. The following tables disclose the number of acres in each fire severity class where harvesting is proposed (Exhibit P-14) and the percent of national forest system land left unharvested by alternative. At least 84 percent of the four fire areas along the west side of the Hungry Horse Reservoir would be left as legacy (Perry and Amaranthus 1997) in all alternatives.

Table 3-6: Legacy area in Alternative B

Fire severity	Fire Acres in West Side Reservoir	Salvage Harvest Acres	% of Fire Area unharvested
High	13,070	2308	83%
Moderate	9353	1934	80%
Low	7900	657	92%
Unburned	1278	0	100%
Total	**31,601**	**4907**	**85%**

Table 3-7: Legacy area in Alternative C

Fire severity	Fire Acres in West Side Reservoir	Salvage Harvest Acres	% of Fire Area unharvested
High	13,070	2155	84%
Moderate	9353	1500	84%
Low	7900	276	97%
Unburned	1278	0	100%
Total	**31,601**	**3931**	**88%**

Table 3-8: Legacy area in Alternative D

Fire severity	Fire Acres in West Side Reservoir	Salvage Harvest Acres	% of Fire Area unharvested
High	13,070	2515	81%
Moderate	9353	2093	78%
Low	7900	687	92%
Unburned	1278	0	100%
Total	**31,601**	**5295**	**84%**

Table 3-9: Legacy area in Alternative E

Fire severity	Fire Acres in West Side Reservoir	Salvage Harvest Acres	% of Fire Area unharvested
High	13,070	2526	81%
Moderate	9353	2117	78%
Low	7900	690	92%
Unburned	1278	0	100%
Total	**31,601**	**5333**	**84%**

Harvest System

As shown in the following table, the majority of acres proposed for harvest in all alternatives would be salvaged using a helicopter system. Hand falling and helicopter yarding is the least impactive method of salvaging trees. No heavy equipment would be on the ground, nor would trees be dragged across the soil. However, more snags may need to be felled for safety.

Table 3-10: Harvest system by Alternative

Harvest system	Alt. B	Alt. C	Alt. D	Alt. E
Ground-based (skid-der/tractor)	622	304	662	662
Skyline	733	592	821	817
Helicopter	3553	3036	3813	3864

Some post-salvage fuel treatments may be necessary in units where accumulations of woody debris inhibit reforestation efforts or pose fire hazards. These accumulations, or "jackpots", could be burned under favorable burning conditions and in coordination with the state air quality requirements. Unmerchantable material would be left standing where possible and practical, although harvest operations can be expected to push some smaller dead trees over.

Reforestation

Prompt reforestation would minimize the time that burned stands are unstocked and unproductive from a timber management standpoint. Skidding from the logging operations, jackpot burning or spot grapple piling would accomplish site preparation for reforestation. Regeneration activities are predicted to provide a fully stocked stand within five years. Species diversity would be maintained or improved through reforestation. Natural regeneration would be monitored and augmented with planting in the event of poor cone crops. The following table displays the number of acres of planting and natural regeneration proposed by alternative.

Table 3-11: Reforestation by alternative

Reforestation Method	Alt. B	Alt. C	Alt. D	Alt. E
Acres to be Planted	1340	1205	1463	1473
Acres of Natural Regeneration	3566	2726	3832	3868

Seedlings planted on national forest system lands almost always (the exception is rust-resistant whitepine) come from seed sources native to the site, and are native species found on the habitat types being planted. This would be the case on the West Side project as well.

Road reclamation for grizzly bear security (Forest Plan requirements) would require planters and thinners to walk distances of 0.5 to 1.5 miles to access some units, increasing unit costs.

Harvest operations are anticipated to take two years. If harvest operations extend to the third year, substantial loss of the value of timber products can be anticipated due to deterioration. Deterioration will be greatest in spruce, subalpine fir, and lodgepole pine trees less than 10” DBH. Should harvest extend into the third year, an estimated 30 to 60 percent of the volume not yet harvested would be affected by cracking. This varies greatly by species (USDA 2000).

Size of openings

The National Forest Management Act requires that openings created in the forest by even-aged silviculture shall be less than 40 acres except in areas harvested as a result of natural catastrophic conditions such as fire, insect and disease or windstorm (36 CFR 219.27,d,iii). The West Side Reservoir fires satisfy the “catastrophic” condition. Salvage units in high fire severity areas would result in even-aged stands because the fire caused 100 percent mortality and all new trees would be one age. Units in low severity fire areas would result in two age classes because residual green trees would provide one age class and newly regenerated trees would be a distinctly younger age. Moderate severity fire areas would result in a mixture of both, because delayed mortality to trees is expected in many areas that presently display green crowns but have fatal root and/or bole scorch.

Cumulative effects

Past, present, and reasonably foreseeable actions as described in Chapter 1 are not expected to greatly influence the succession, structural distribution, or fire severity class for vegetation when combined with salvaging fire-killed trees. Rates of blowdown of fire-damaged or fire-killed trees may increase as a result of existing harvest openings.

Past, present, reasonably foreseeable, and similar actions considered for cumulative effects

Past Activities

Past harvest occurred on about 20 percent of lands within the West Side Reservoir fire boundaries. Harvested areas have been regenerated, either naturally or artificially, and were in various stages of growth at the time of the fire, as described earlier in the vegetation section. A complete list and description of past, present, and reasonably foreseeable activities is found at the end of Chapter 1.

Suppression tactics used to control the fires directly affected some vegetation resources. Documented impacts to vegetation resulted from:

a) Construction of dozer lines along previously closed road systems and on previously undisturbed sites.
b) Creation of "safety zones", staging areas, and drop points within the fire perimeter.
c) Removal of aerial fuels and hazard trees during line construction activities.
d) Reduction of fuels and vegetation ahead of the fire-front by backfire operations (BAER report).

Rehabilitation of the above items was undertaken at the end of the fire. Waterbars and woody debris have been placed in dozer lines, and disturbed ground has been seeded with non-invasive grass seed.

Removal of hazard trees (non-windfirm snags) along roads within the fire was completed in August of 2004. Adequate woody debris and residual snags remain for soil nutrient cycling.

Mushroom harvesting occurred during the summer of 2004 within the fires, and although individual conifer germinants may have been affected, overall regeneration is expected to be abundant.

Noxious weed treatments will occur during the summer of 2004, which is beneficial to native plants.

These past activities, taken in consideration with the proposed salvage of dead and dying trees, should not result in any long-term detrimental effects to the vegetation resource in the project area.

Present Activities

Special forest products gathering for personal use is likely to continue, such as berry picking, firewood and Christmas tree cutting, evergreen bough and cone collection, particularly in those areas unaffected by the fire. Christmas tree harvesting and bough collection affect a miniscule proportion of trees in the drainage, and can serve to prune and thin on a small scale.

Road and culvert improvements are continuing in the drainage, but do not affect the vegetation resource to any substantial degree.

Reasonably Foreseeable Actions

Replanting of previously harvested units where regeneration was consumed by the fire is planned during the spring and early summer of 2005.

The network of roads in a forest facilitates economic management of forest resources. There are presently about 337 miles of road under Forest Service jurisdiction in the West Side Reservoir fires, with access ranging from open yearlong to those closed and allowed to naturally revegetate. However, Amendment 19 to the Forest Plan has yet to be fully implemented, and it likely will result in the reclamation of more roads to improve grizzly bear security.

Fuel reduction activities by holders of permits for Recreation Residences at Heinrude Creek would be beneficial to the residual trees, allowing more growing space and access to sunlight, nutrients, and water, and improving the odds for their surviving a fire in the future if a crown fire is averted.

Alternative A

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. Although a list of all known activities, past, present, and future are listed earlier in Chapter 1, few of them have any direct, indirect, or cumulative impact to vegetation in conjunction with the no action alternative. Short of conversion to agricultural land or a paved road, which are not foreseeable, forest vegetation will return to sites in the West Side Reservoir area. Disturbances to vegetation, either naturally occurring, such as wind, fire, or flood, or through past harvest, are all short-term. Habitat types in northwestern Montana are generally highly productive for vegetative biomass, the climate provides adequate moisture, and seed dispersal from adjacent live trees, shrubs, grasses, bird and animal droppings, and residual seed in the soil will aid in renewal. The one percent of soils severely affected by fire intensity will be slower to recover, but will in time (see soils section in chapter 3). Disturbances caused by suppression activities have all undergone rehabilitation and no lasting effects to vegetation are expected.

The closure of some amount of road is a reasonably foreseeable action with the no action alternative because it is required under the amended Forest Plan. Former roadbed will slowly colonize and become vegetated. The effect is that access for vegetation inventory, monitoring, and management may be substantially diminished.

It is unlikely that mushroom harvesting will have affected the rate of regeneration within the burned area to any substantial degree. Although substantial numbers of people were on nearly all 31,000 acres of the fires, and tender germinants undoubtedly were repeatedly stepped on, natural regeneration of lodgepole pine is so great, the fire area will probably only have isolated areas where regeneration is a problem.

Areas affected by suppression efforts were seeded with non-invasive grass species, mainly annual rye, which should not persist past next growing season, allowing native species to become established.

The bottom line for cumulative effects to vegetation is that, as mentioned above, short of paving, vegetation is irrepressible. Even where soils have been compacted such as roadbeds, experience shows that grasses, alder, and conifers can all become established. Conifer productivity is known to decline on abandoned roadbeds where soil is compacted.

Action Alternatives B, C, D and E

The removal of dead trees, in conjunction with the past, present and reasonably foreseeable activities cited in Chapter 1 and reiterated earlier in this section, should not have a substantial impact on the vegetation resource in terms of structure, function, or composition. Fire was the substantial disturbance; any salvage activity of dead and imminently dead trees is not going to affect the ability of vegetation to continue to function as it has since the glaciers receded. Artificial regeneration would introduce biological diversity in areas that would otherwise be expected to develop into a lodgepole pine monoculture. Disturbances caused by suppression activities on the West Side Reservoir fires have all undergone rehabilitation, including revegetation with annual rye (a short-lived annual) and native species; no lasting effects to vegetation are expected.

It is unlikely that mushroom harvesting during the spring and summer of 2004 affected the rate of regeneration with the burned area. Large numbers of people combed nearly all 31,600 acres of the fires along the west side of Hungry Horse Reservoir, and tender emerging seedlings were undoubtedly stepped on. It is not possible to determine the percent survival of seedlings under these conditions. A very minor amount of mushroom harvesting activity can be expected in future years as green plants become established and conditions for the flush of fungi are no longer present.

Road closures and decommissioning have been occurring in the drainage for many years and will continue to occur. The cumulative effect of this is a continuous reduction in access for both the public and for management activities. Costs for monitoring and managing the vegetation resource can be expected to increase, though the exact amount is hard to determine.

According to Perry and Amaranthus (1997), management systems can be devised that sustain productivity and biological diversity. Design criteria for this project includes consideration for soils, woody debris for nutrient cycling, and conifer regeneration, which would ensure that implementing any of the action alternatives would not destroy indigenous biological diversity or soil integrity on this landscape. The action alternatives contain plans for the future through regeneration of the forest with a diversity of species, and at a landscape scale. Future generations may then have options for forest management.

REGULATORY FRAMEWORK AND CONSISTENCY

The National Forest Management Act (NFMA) (16 USC 1604) requires that Forest plans "reserve and enhance the diversity of plant and animal communities… so that it is at least as great as that which can be expected in the natural forest" (36 CFR 219.27). Additional direction states that "management prescriptions, where appropriate and the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is as least great as that which could be expected in a natural forest and the diversity of tree species is similar to that existing in the planning area."

Vegetation

Flathead National Forest Plan (LRMP) goals include maintaining a diversity of vegetation and habitats across the forest to meet the needs of a variety of wildlife species, and to provide for a sustained yield of timber products (LRMP, original, II-5). NFMA implementing regulations also require that management consider the existing diversity of plant and animal communities. The LRMP further defines timber management goals of providing a sustained yield of timber products that is cost-effective, responsive to the needs of the local economy, and is consistent with other Forest Management goals (LRMP II-5). These goals are discussed in Forest-wide timber management objectives described on pages II-7 to II-9 of the LRMP.

The NFMA requires that "timber will be harvested from national forest system lands only where there is assurance that such lands can be restocked within five years of harvest." Determination of adequate stocking would be based on regeneration surveys conducted one, three, and five years following tree planting or site preparation for natural regeneration. Numbers of trees per acre and stocking percentages would be calculated from these surveys, and compared to the minimum and desired stocking levels identified in the harvest prescription for each particular stand.

The LRMP provides goals, objectives, and standards for protection and improvement of the timber resource and other vegetation (LRMP pgs II 5-8 and II 38-40). In accordance with this direction, the area has been analyzed and determined that all alternatives are within the standards set in the Forest Plan. Therefore, all alternatives are consistent with LRMP direction and its amendments concerning vegetation.

Old Growth Habitat (Late Seral)

Amendment 21 to the Flathead Forest Plan (management direction related to old growth forests) was signed in January 1999. It has a goal to "maintain and recruit old growth forests to an amount and distribution that is within the 75 percent range around the median of the historical range of variability. Where current conditions are below this amount, actively manage to recruit additional old growth." Another goal is to "ensure that Forest Service actions do not contribute to the loss of viability of native species." For species associated with old growth forests, there are objectives to "maintain ecological processes and provide for natural patch size distribution" and to "manage landscape patterns to develop larger old growth patch sizes where needed to satisfy wildlife habitat requirements." Across the landscape, "sufficient retention of forest structure (large-diameter live trees, snags, and coarse woody debris)" should be left to provide for future wildlife movement through the matrix surrounding old growth forests. At the landscape level, there is also a standard that states that "treatments within existing old growth may be appropriate where current insect and disease conditions pose a major and immediate threat to other stands." Another standard states that vegetation treatments should be modified "as needed to meet habitat needs of old growth associated species." If needed to "satisfy wildlife habitat requirements, limit associated human disturbance, or reduce excessive mortality risk," the timing, extent, and intensity of vegetation treatments should be modified.

As described earlier in this chapter, no salvage harvest would occur in old growth habitat. Also see "Snag and Downed Woody Habitat" for further discussion of regulatory consistency in regards to snags and old growth.

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